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A2B
(71) Applicants
Cadbury Typhoo Limited,
Bournville,
Birmingham B30 2LU
(72) Inventors
Alan Robert Wiggett
Paul Edward
Hebblethwaite
David John Peters
(74) Agents
Marks & Clerk,
Alpha Tower,
ATV Centre,
Birmingham B1 1TT

(54) **Fruit composition and method of manufacture thereof**

(57) A fruit composition is manufactured by heating fruit, sugar and water to cook the fruit and cause the sugar to be absorbed into the fruit. At least one gelling agent (e.g. low methoxyl pectin alginate or carrageenan) and a gel thickener (e.g. agar, CMC or an edible gum) are added to the cooked mixture. The fruit, sugar, water, gelling agent, gel thickener, a preservative and, optionally, one or more artificial sweeteners are added in amounts such as to give a composition having a fruit content of 10 to 50% by weight, a total soluble solids content of 30 to 55% by weight, a gel thickener content of 0.05 to 0.50% by weight, a preservative content of 250 to 1000 ppm by weight, and a gelling agent content of 0.5 to 1.0% by weight for a spreadable fruit composition which is resistant to syneresis or 0.25 to 0.5% by weight for a pourable fruit composition which has a pleasing texture and a non-hazy appearance.

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SPECIFICATION

Fruit composition and method of manufacture thereof

This invention relates to a fruit composition and to a method of manufacture thereof. In one aspect the invention relates to a spreadable fruit composition or low sugar jam or marmalade; whilst in another aspect the invention relates to a pourable fruit composition which can be used, for example, as a low sugar additive to yoghurt or other desserts or as a low sugar topping thereon in order to impart a fruit flavour to such desserts.

In the case of spreadable fruit compositions, under current legislation, jam or marmalade compositions in the United Kingdom must have a total soluble solids content of at least 65% by weight and the use of an artificial preservative is prohibited. In other parts of Europe, low-sugar jams or marmalades having a total soluble solids content of less than 65% by weight and containing sorbic acid or one of its salts as a preservative, are permitted. However, such low-sugar jams and marmalades do not have the same texture as the high-sugar jams and marmalades sold in the United Kingdom. This is because high-sugar preserves (i.e. preserves having a total soluble solids content of at least 65% by weight) have stronger gel and are much more resistant to syneresis than low-sugar preserves. Syneresis is the 'weeping' of the gel i.e. the release of sugar syrup, when the gel is broken by removing a portion of the preserve with a spoon, for example.

It is an object of said one aspect of the present invention to provide a low-sugar fruit composition which more nearly matches the characteristics of gel stability and rigidity possessed by conventional high sugar preserves.

According to said one aspect of the present invention, there is provided a spreadable fruit composition having a fruit content of 10 to 50%, preferably 30 to 50% by weight and a total soluble solids content of 30 to 55% preferably 40 to 50% by weight provided by any one or more sugars (e.g. sucrose, glucose, fructose) together with, if desired, the addition of one or more artificial sweeteners (e.g. saccharin) to attain the desired level of sweetness in the final composition, and including a gelling material comprising (a) 0.5 to 1.0%, preferably 0.6 to 0.9% by weight of at least one gelling agent, (e.g. low methoxyl pectin, alginate, carageenan, and (b) 0.05 to 0.50% by weight of a gel thickener (e.g. agar, carboxymethyl cellulose, or an edible gum such as locust bean, xanthan or guar gum), the composition also including 250 to 1000 ppm (by weight) of a permitted preservative e.g. sorbic acid or potassium sorbate.

As is usual with jams and other spreadable compositions, it is important to maintain the required acidity in the composition and also to control the degree of gelation by controlling the available calcium ions present in the composition. This is well understood by a person skilled in the art and a suitable pH range for the composition is 3.0 to 4.2, preferably 3.2 to 3.5. Depending upon the available calcium ion concentration of the raw ingredients used to form the composition, additional calcium ions or a sequestering agent, e.g. sodium hexametaphosphate or tetra sodium pyrophosphate, may be required to control the calcium ion concentration. The amount of calcium ions or sequestering agent required is usually determined on a trial and experiment basis because of the high number of factors which affect the degree of gelation of the particular composition being produced. Factors which affect the calcium ion concentration are the hardness of the water, the type of fruit, and the form in which the fruit is provided. As a general rule with the spreadable fruit composition, calcium ions will be added in the form of a sparingly soluble calcium salt (e.g. calcium tetrahydrogen diphosphate) to promote gelation where the natural calcium content of the fruit is low and/or where the content of the fruit in the composition is low. A sequestering agent to reduce the available calcium ion concentration may be employed where the fruit content is high and/or where the fruit employed has a high natural calcium content. A sequestering agent may also be employed in cases where calcium ions have been added to the raw fruit used to form the composition.

The thickener is preferably an edible gum. Although the gum may be used in an amount of 0.05 to 0.50% by weight of the composition, it is most preferably used in an amount of about 0.10 to 0.3% by weight. However, the precise amount used depends upon the fruit employed.

The gelling agent is most preferably low methoxyl pectin, although a mixture of low methoxyl pectin and an alginate e.g. sodium alginate, or a carageenan may be employed. Where the gelling agent used is an alginate or carageenan alone, it will be used in an amount which is the higher end of the specified range of 0.5 to 1.0% by weight. An alginate or carageenan may be used in smaller amounts if used in combination with another gelling agent e.g. 0.3% alginate and 0.2% low methoxyl pectin giving a gelling agent content of 0.5% by weight. The most preferred gelling agent is low methoxyl pectin having a degree of amidation of 18 to 22% and a degree of esterification of 28 to 34%, although low methoxyl pectins with degrees of amidation of 15 to 30% and degrees of esterification of 25 to 40% will also perform adequately. Where an alginate is used, one having a high gel strength (a high guluronic acid content) is preferred.

Subject to the preferred operation parameters mentioned above, the amounts of gelling agent and gel thickener which are typically used for various ranges of the total soluble solids (TTS) content are set out in the Table below:–

TABLE

% TSS RANGE	*GELLING AGENTS % By Wt.*	*GEL THICKENERS % By Wt.*
30 to 35	0.5 to 0.7	0.3 to 0.5
35 to 40	0.5 to 0.7	0.3 to 0.5
40 to 45	0.6 to 1.0	0.3 to 0.5
45 to 50	0.6 to 0.9	0.15 to 0.3
50 to 55	0.6 to 0.8	0.05 to 0.2

Also according to said one aspect of the present invention, there is provided a method of manufacturing a spreadable fruit composition comprising the steps of heating fruit, sugar and water at atmospheric or reduced pressure to cook the fruit and cause the sugar to be absorbed into the fruit, and then adding at least one gelling agent, e.g. low methoxyl pectin, an alginate or carageenan, and a gel thickener (e.g. carboxy methy cellulose or an edible gum such as locust bean, xanthan or guar gum), to the cooked mixture; the fruit, sugar, water, gelling agent, gel thickener and a preservative (e.g. potassium sorbate) and, optionally, one or more artificial sweeteners being included in amounts such as to give a composition having a fruit content of 10 to 50%, preferably 30 to 50% by weight; a total soluble solids contents of 30 to 55% preferably 40 to 50% by weight, a gelling agent content of 0.5 to 1.0% by weight, a gel thickener content of 0.05 to 0.50% by weight, and a preservative content of 250 to 1000 ppm by weight.

In the case of pourable fruit compositions, the Applicants have found conventional fruit compositions for addition to yoghurt or other desserts are thickened using a starch such as cornstarch which imparts an undesirable haze to the composition.

It is therefore an object of said another aspect of the present invention to provide a pourable fruit composition in which the above disadvantages are obviated or mitigated and which has a pleasing appearance and a pleasing texture.

According to said another aspect of the present invention, there is provided a pourable fruit composition having a fruit content of 10 to 50%, preferably 30 to 50% by weight and a total soluble solids content of 30 to 55%, preferably 40 to 50% by weight provided by any one or more sugars (e.g. sucrose, glucose, fructose) together with, if desired, the addition of one or more artificial sweeteners (e.g. saccharin) to attain the desired level of sweetness in the final composition, and including a gelling material comprising (a) 0.25 to 0.5%, preferably 0.35 to 0.5% by weight of at least one gelling agent, (e.g. low methoxyl pectin, alginate, carageenan), and (b) 0.05 to 0.50% by weight of a gel thickener (e.g. agar, carboxy methyl cellulose, or an edible gum such as locust bean, xanthan or guar gum), the composition also including 250 to 1000 ppm (by weight) of a permitted preservative e.g. sorbic acid or potassium sorbate.

The above described requirements for controlling the acidity and degree of gelation in relation to the spreadable fruit composition of the present invention apply also to the pourable fruit composition of the present invention, except that, in the place of a sparingly soluble calcium salt, a rather more soluble calcium salt eg. calcium chloride, will be added where necessary to promote gelation.

As in the case of the spreadable fruit composition the pourable fruit composition preferably employs an edible gum as the thickener in a preferred amount of 0.10 to 0.3% by weight.

Also according to said another aspect of the present invention, there is provided a method of manufacturing a pourable fruit composition comprising the steps of heating fruit, sugar and water at atmospheric or reduced pressure to cook the fruit and cause the sugar to be absorbed into the fruit, and then adding at least one gelling agent, e.g. low methoxyl pectin, an alginate or carageenan, and a gel thickener e.g. carboxy methyl cellulose or an edible gum (eg locust bean, xanthan or guar gum), to the cooked mixture; the fruit, sugar, water, gelling agent gel thickener and a preservative (e.g. potassium sorbate) and, optionally, one or more artificial sweeteners being included in amounts such as to give a composition having a fruit content of 10 to 50%, preferably 30 to 50% by weight; a total soluble solids content of 30 to 55% preferably 40 to 50% by weight a gelling agent content of 0.25 to 0.5% preferably 0.35 to 0.5% by weight, a gel thickener content of 0.05 to 0.50% by weight and a preservative content of 250 to 1000 ppm by weight.

Examples of the present invention will now be described. In the following examples, the weight percentages of the ingredients are the weight percentages in the *final* composition.

EXAMPLE 1.

Frozen raspberries, sugar (sucrose), water, sodium citrate and permitted colouring were added to a boiling pan in an amount such as to give a fruit content of 10% by weight a TSS content of 30% and a pH of 3.2 to 3.4 in the final composition, and heated to 90 degrees C. To the mixture was then added tetra sodium pyrophosphate at 0.3% by weight. Following this, 0.2% by weight of low methoxyl pectin having a degree of amindation of 18 to 22% and a degree of esterification of 28 to 34%, 0.5% by weight sodium alginate, 0.2% by weight locust bean gum (gel thickener) were added along with 500 ppm of potassium sorbate.

A spreadable fruit composition having a good gel and good resistance to syneresis was obtained.

EXAMPLE 2.

A frozen fruit composition containing 4 parts by weight of frozen strawberries and one part by weight of a mixture of sucrose and calcium lactate, sugar, water and permitted colour were added to a boiling pan in an amount such as to give 38% by weight of fruit and a total soluble solids content of 50% by weight in the final composition. Sodium citrate was also added to the boiling pan in order to maintain a pH in the range of 3.2 to 3.4 in the final composition. The resultant composition was heated in the boiling pan for 15 minutes at a temperature of 85 degrees C under a pressure of 380 mm of mercury. Following this, 0.3% dry weight of sodium hexametaphosphate, 0.85% by wt, of the same low methoxyl pectin as used in Example 1 and 0.18% by weight of guar gum were added to the cooked mixture together with 500 ppm of potassium sorbate. After this, the resultant mixture was cooled to 75 degrees C and 0.5% by wt. of citric acid was added to impart a tanginess to the final composition.

The final composition was a spreadable fruit composition having a strong gel and was more resistant to syneresis even than a conventional high-sugar strawberry jam containing at least 65% by weight of

total soluble solids.

EXAMPLE 3.

In the preparation of a low sugar orange jelly marmalade having a fruit content of 30% by weight and a TSS of 50% by weight a mixture of clarified orange extract and drained peel were mixed with sugar, water, permitted colouring and sodium citrate (0.6% weight of a 30% solution). To this mixture was added sufficient calcium tetrahydrogen diphosphate in solution to bring the calcium ion concentration in the mixture to between 20-50 mg. calcium/g of pectin, preferably 30-35 mg.

The mixture was cooked as described in Example 2. To the resulting mixture was added 0.8% by weight low methoxyl pectin, 0.18% guar gum and 500 ppm potassium sorbate. Citric acid was added to bring the pH to 3.2 to 3.4. The resultant composition was a spreadable gel of good strength and good resistance to syneresis.

EXAMPLE 4.

Frozen rasberries, sugar (sucrose), water, sodium citrate, 0.3% by weight of tetrasodium pyrophosphate and permitted colouring were added to a boiling pan in an amount such as to give a fruit content of 30% by weight a total soluble solids content of 30% by weight and a pH of 3.2 to 3.4 in the final composition. The mixture was heated to boiling at 82 to 85 degrees C under a pressure of 380 mm of mercury for 5 to 10 minutes. During this time, some evaporation took place. Following this 0.2% by weight of the low methoxyl pectin, having a degree of amidation of 18 to 22% and a degree of esterification of 28 to 34%, 0.3% by weight of solium alginate and 0.2% by weight of locust bean gum were added to the mixture along with 500 ppm of potassium sorbate. The mixture was stirred sufficiently to disperse the added ingredients thoroughly and then the resulting mixture was cooled.

A high gel strength, spreadable fruit composition having a good resistance to syneresis was obtained.

EXAMPLE 5.

Example 4 was repeated except that the sugars composition was adjusted to give a total soluble solids content of 50% by weight and 0.85% by weight of the low methoxyl pectin and 0.15% by weight of guar gum instead of the locust bean gum were added. The tetrasodium pyrophosphate addition was omitted.

The final composition was a spreadable fruit composition having a texture which was very close to that of a conventional jam having a total soluble solids content at least 65% by weight and, in particular, the final composition had a stronger gel and was much more resistant to syneresis than a conventional low sugar preserve.

EXAMPLE 6.

In the preparation of a low sugar high fruit raspberry jam the method was as described in Example 4 except that the frozen raspberries were used in an amount such as to give a fruit content of 50% by weight and sufficient sugar was added to give a TSS content of 50% by weight, and also 0.8% by weight of the low methoxyl pectin and 0.1% by weight xanthan gum (instead of locust bean gum as the gel thickener) were added, together with 500 ppm of potassium sorbate and the requisite amount of citric acid and sodium citrate to impart desirable acidity and pH in the range 3.2 and 3.4.

The resultant composition had a strong fruit flavour, a good resistance to syneresis and spread well.

In all of the above examples, the final composition was filled into jars at a temperature of 75 degrees C. However, the filling temperature could be anywhere in the range of 60 degrees C to 85 degrees C.

The processing temperature may be anywhere in the range of 70 degrees C and 105 degrees C depending upon the pressure employed.

EXAMPLE 7.

Frozen rasperries, sugar (sucrose), water, sodium citrate, calcium chloride and permitted colouring were added to a boiling pan in an amount such as to give a fruit content of 45% by weight, a total soluble solids contents of 40% by weight and a pH of 3.2 to 3.4 in the final composition. The mixture was heated to boiling at 82 to 85 degrees C under a pressure of 380 mm of mercury for 5 to 10 minutes. During this time, some evaporation took place. Following this 0.4% by weight of low methoxyl pectin having a degree of amidation of 19 to 24% and a degree of esterification of 25 to 30% and 0.2 by weight of guar gum were added to the mixture along with 1000 ppm of potassium sorbate. The mixture was stirred sufficiently to disperse the added ingredients thoroughly and then the resulting mixture was cooled.

The resultant pourable fruit composition was a sol of a consistency suitable for using with yoghurt or other desserts to impart a fruit flavour, had a pleasing texture and clear non-hazy appearance, and was resistant to syneresis.

EXAMPLE 8.

A frozen fruit composition containing 4 parts by weight of frozen strawberried and one part by weight of a mixture of sucrose and calcium lactaten sugar, water and permitted colouring were added to a boiling pan in an amount such as to give a fruit content of 45% by weight, a total soluble solids content of 40% by weight and a pH of 3.2 to 3.4 in the final composition. The mixture was heated to boiling at 82 to 85 degrees C under apressure of 380mm Hg for 5 ro 10 minutes. During this time some evaporation took place. Following this, 0.3% by weight of sodium hexametaphosphate, 0.3% by weight of low methoxyl pectin having a degree of amidation of 18 to 22% and a degree of esterification of 28 to 34%, and 0.4% locust bean gum were added to the mixture along with 1000 ppm of potassium sorbate. The mixture was stirred sufficiently to dispose the added ingredients thoroughly and then the resultant mixture was cooled.

A pourable fruit composition resulted which was a clear sol having a pleasant texture and a fruit flavour and which was resistant to synesesis.

CLAIMS

1. A spreadable fruit composition having a fruit content of 10 to 50% by weight and a total solids content of 30 to 55% by weight provided by one or more sugars together with the optional addition of one or more artificial sweeteners; and including a gelling material comprising (a) 0.5 to 1.0% by weight

of at least one gelling agent and (b) 0.05 to 0.50% by weight of a gel thickener, the composition also including 250 to 1000 ppm by weight of a permitted preservative.

2. A pourable fruit composition having a fruit content of 10 to 50% by weight and a total solids content of 30 to 55% by weight provided by one or more sugars together with the optional addition of one or more artificial sweeteners; and including a gelling material comprising (a) 0.25 to 0.5% by weight of at least one gelling agent and (b) 0.05 to 0.50% by weight of a gel thickener, the composition also including 250 to 1000 ppm by weight of a permitted preservative.

3. A composition as claimed in claim 1 or 2, having a fruit content of 30-50% by weight.

4. A composition as claimed in claim 1, 2 or 3, having a total soluble solids content of 40-50% by weight.

5. A composition as claimed in any preceding claim, wherein the thickener is an edible gum.

6. A composition as claimed in claim 5, wherein the edible gum is present in an amount of 0.10 to 0.3% by weight of the composition.

7. A composition as claimed in claim 5 or 6, wherein the edible gum is locust bean gum.

8. A composition as claimed in claim 5 or 6, wherein the edible gum is xanthan gum.

9. A composition as claimed in claim 5 or 6, wherein the edible gum is guar gum.

10. A composition as claimed in any preceding claim, wherein the gelling agent is low methoxyl pectin.

11. A composition as claimed in claim 10, wherein the low methoxyl pectin has a degree of amidation of 15 to 30% and a degree of esterification of 25 to 40%.

12. A composition as claimed in claim 10, wherein the low methoxyl pectin has a degree of amidation of 18 to 22% and a degree of esterification of 28 to 34%.

13. A composition as claimed in claim 10, wherein the low methoxyl pectin has a degree of amidation of 19 to 24% and a degree of esterification of 25 to 30%.

14. A composition as claimed in any one of claims 1 and 3 to 12 when appended to claim 1, wherein said at least one gelling agent is present in an amount of 0.6 to 0.9% by weight of the composition.

15. A composition as claimed in any one of claims 2 and 3 to 11 and 13 when appended to claim 2, wherein said at least one gelling agent is present in an amount of 0.35 to 0.5% by weight of the composition.

16. A method of manufacturing a spreadable fruit composition comprising the steps of heating fruit, sugar and water at atmospheric or reduced pressure to cook the fruit and cause the sugar to be absorbed into the fruit, and then adding at least one gelling agent and a gel thickener to the cooked mixture; the fruit, sugar, water, gelling agent, gel thickener and a preservative and, optionally, one or more artificial sweeteners being included in amounts such as to give a spreadable fruit composition having fruit content of 10 to 50% by weight, a total soluble solids content of 30 to 55% by weight, a gelling agent content of 0.5 to 1.0% by weight a gel thickener content of 0.05 to 0.50% by weight an a preservative content of 250 to 1000 ppm by weight.

17. A method of manufacturing a pourable fruit composition comprising the steps of heating fruit, sugar and water at atmospheric or reduced pressure to cook the fruit and cause the sugar to be absorbed into the fruit, and then adding at least one gelling agent and a gel thickener to the cooked mixture, the fruit, sugar, water, gelling agent, gel thickener and a preservative and, optionally, one or more artificial sweeteners being included in amounts such as to give a pourable fruit composition having a fruit content of 10 to 50% by weight, a total soluble solids content of 30 to 55% by weight, a gelling agent content of 0.25 to 0.5% by weight a gel thickener content of 0.05 to 0.50% by weight, and a preservative content of 250 to 1000 ppm by weight.

18. A fruit composition when manufactured by the method as claimed in claim 16 or 17.

19. A method of manufacturing a spreadable fruit composition substantially as hereinbefore described in any one of Examples 1 to 6.

20. A method of manufacturing a pourable fruit composition substantially as hereinbefore described in Example 7 or 8.

21. A spreadable fruit composition substantially as hereinbefore described in any one of Examples 1 to 6.

22. A pourable fruit composition substantially as hereinbefore described in Example 7 or 8.

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